

REMARKS

Favorable reconsideration of this application, in light of the preceding amendments and following remarks, is respectfully requested.

Claims 4-6 and 8-13 are pending in this application. Claim 4 is amended. Claim 7 is cancelled. Claims 8-13 are newly added. Claims 4, 10 and 11 are independent claims.

Claim Rejections under 35 U.S.C. §112

Claims 4-7 stand rejected under 35 U.S.C. § 112, first paragraph as failing to comply with the written description requirement. In particular, the Examiner asserts the language “different periodicity in a video frame” is not supported. Claim 7 is cancelled, and the language “different periodicity in a video frame” is removed from claim 4.

Therefore, the rejection of claims 4-7 under 35 U.S.C. § 112, first paragraph is rendered moot. Applicants note that remarks distinguishing claims 4-6 over the previously cited references of Di Matteo et al. (U.S. Patent No. 4,511,252, herein Di Matteo), Poradish et al. (U.S. Patent No. 5,905,545, herein Poradish) and Kado et al. (U.S. Patent No. 5,410,609, herein Kado) are included following remarks regarding the new claims.

Discussion of New Claims

Claims 8-13 are newly added and Applicants take the opportunity to specifically address how some of these claims are believed to distinguish over Di Matteo, Poradish and Kado, which were previously used to reject independent claim 4 of this application.

Claim 9:

Claim 9 recites “the determining a three-dimensional image **does not require comparing said object surface with a reference surface**.” Applicants respectfully submit that dependent claim 9 distinguishes over the previously-used primary reference at least because analyzing the body 20 in Di Matteo requires that measurements be taken from a reference object as shown in FIGS. 6, 9, 18-20. Further, column 7, lines 17-22 states the following:

To find the coordinates of the point P in space, a reference surface 52 is used to replace the body 20 on the support 24 as shown in FIG. 6. The general position of the reference surface 52 with respect to the projector 26 and the camera 40 is the same as for the body 20.

According to Di Matteo, if a surface of a body 20 is not compared with a known reference surface 52 that is measured and/or specified mathematically as indicated in column 10, lines 48-50, the method and system described in Di Matteo cannot provide a three-dimensional image of the body 20.

Claim 10:

New claim 10 recites, inter alia, “registering said image of said object with a single color camera from a direction different from said beam path, the single color camera always registering a same perspective of said object; and determining a three-dimensional image of a topography of said object surface from said registration.” Applicants respectfully submit that Di Matteo fails to disclose, teach or suggest at least these features of new claim 10 because Di Matteo requires that data be obtained from multiple perspectives of the body 20. As shown in FIGS. 1 and 1a, data from multiple cameras 40 is obtained. Each of the multiple cameras 40 has a different perspective of the body 20 in FIGS. 1 and 1A. Column 10, lines 60-68 of Di Matteo states the following regarding the possibility of using a camera and a single projector.

In accordance with the present invention, it is not essential that more than a single projector be used. When using such a single projector only and omitting the remaining projectors shown in FIG. 1, the present invention provides a rotating and indexing mechanism 102 which rotates the support 24 through predetermined angles in progressive steps.

Accordingly, even if a single projector or camera is used the object must be rotated. As such, Di Matteo requires that data from different perspectives of the body 20 be obtained.

Claim 11:

Newly added independent claim 11 includes features somewhat similar to new claim 10 and thus, is believed to be allowable over Di Matteo for similar reasons.

In light of the above, Applicants respectfully submit that dependent claim 9 and independent claims 10 and 11 are allowable over Di Matteo for at least the reasons indicated above. Further, the secondary references of Poradish and Kado fail to cure these deficiencies of Di Matteo even if they can be combined with Di Matteo, which Applicants do not admit.

Discussion of Independent Claim 4

Amended claim 4 is also believed to distinguish over the previously cited references of Di Matteo, Poradish and Kado.

Initially, Applicants note that amended claim 4 recites “successively projecting a number of encoded illumination patterns by driving said digital micro-mirror arrangement to sequentially illuminate said object surface, with the digital micro-mirror arrangement being sequentially illuminated with at least three colors in a beam path through a variable color filter onto said object surface for identification of at least three depth planes of said object in a single image; registering said image of said object with a color camera from a direction different from said beam path; and determining a three-dimensional image of a topography of said object surface from said registration in a control and evaluation unit, the determining including the use of at least triangulation principles.” Applicants respectfully submit that at least the above-emphasized features of independent claim 4 patentably distinguish over Di Matteo.

Applicants note that the light projected onto an object can be encoded in different ways. The general term used in the German language is "codierter Lichtansatz" [coded light approach], which can be traced back to two-dimensional gray scale images from which three-dimensional data are obtained through logical linking. An additional method consists of alternately projecting black-and-white bands. A different coding method makes use of different colors. Further, a third method involves the use of phase displacements for the coding. In all three or four of these coding methods, an object is illuminated in such a way that a plurality of sectors are present, wherein it is known for each sector whether it is black or white, which of approximately three colors it has, wherein these colors can be red, blue or green, and which phase displacement exists in which sector.

Accordingly, if an optionally positioned sensor with one-dimensional resolution and/or a sensor detecting records an image at an optional time and at an optional point in one of these sectors while functioning as receiver, it can be determined which black-and-white band at this instant belongs to this point or which colored band is associated with this point, or which phase displacement is associated with this point. The determination can be made based on the fact that for all object sectors, the black-and-white distribution or the color distribution is known and which phase displacements differentiate the various sectors from each other.

The above-mentioned coding options are generally not used together. A plurality of side-by-side arranged sectors of an object are illuminated, wherein these are generally bands. A face-

shift method exists when differences in the periodicity are measured. As soon as differences in adjacent light regions, which differ in color, are used there is a color coding.

The periodicity and method described in Di Matteo does not have anything in common with the “encoded illumination patterns by driving said digital micro-mirror arrangement to sequentially illuminate,” recited in independent claim 4. In fact, Di Matteo discloses a totally different image processing system as the one disclosed in our patent application. Applicants submit that Poradish and Kado fail to cure these deficiencies of Di Matteo.

Therefore, Applicants submit that independent claim 4, as well as all claims depending therefrom, are allowable.

CONCLUSION

Applicants earnestly request reconsideration and allowance of all pending claims.

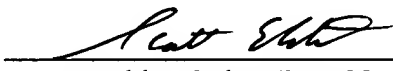
Pursuant to 37 C.F.R. §§ 1.17 and 1.136(a), Applicant(s) hereby petition(s) for a two (2) month extension of time for filing a reply to the outstanding Office Action and submit the required \$450 extension fee herewith.

Should there be any matters that need to be resolved in the present application, the Examiner is respectfully requested to contact the undersigned at the telephone number of the undersigned below

The Commissioner is authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

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